J.L Geotechnical

Helping others find their footing

Acid Sulfate Soil Investigation

12 Illawong Close Davistown NSW 2251

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Version	Date
V3	17/12/2024

Executive Summary

JL Geotechnical (JLG) was commissioned by Maureen Reid ('the client') to conduct an Acid Sulphate Soil (ASS) investigation for the land located at 12 Illawong Close Davistown NSW.

The objectives of the ASS investigation are to:

- Ascertain the presence/absence of Acid Sulfate Soil (ASS) underneath the site
- Assess the significance of potential ASS impacts for a proposed residential redevelopment
- Make recommendations to inform management options (if necessary)

JLG accessed the NSW Government Planning Portal and NSW SixMaps on 5 December 2024 to obtain information about the site. Based on our review, it indicated that the site is rectangular and covers an area of 550m^2. The site is bounded by low density residential properties to the north, south and west and Illawong Close to the east.

The site is legally identified as Lot 71 DP247248 and is located within the boundaries of the Central Coast Council (the council). The site is zoned as "R2-Low Density Residential" and development on the site is controlled by Gosford Development Control Plan 2013 (1 May 2020) and Wyong Development Control Plan 2013 (23 December 2020), now the "Central Coast Development Control Plan (DCP) 2022".

Based on our review of the "Central Coast Development Plan 2022" (CCDP)section 7.1, the site is classified as Class 2 and that indicates acid sulfate soils are likely to be found below the natural ground surface. According to CCDP, works below the natural ground surface (e.g. footings/foundations) require an Acid Sulfate Soil Management Plan.

JLG reviewed the proposed development plans, and it indicated that the site is being proposed for the construction of a standalone one-storey residence with a footprint of about 260m^2. The proposed site layout indicated that soft and hard landscape areas would occupy the remaining areas of the site.

JLG conducted a site walkover and an intrusive investigation at the site on 21 November 2024. Intrusive investigation at the site was carried out by way of two soil bores that were nominated as BH1 and BH2. These two soil bores, advanced using a Christie track-mounted rig, were nominated within the footprint of the proposed residence.

Soil profiles encountered in BH1 and BH2 comprised anthropogenic fill overlying unconsolidated channel deposit consisting of silty sand/sand. Five representative soil samples (SS1-SS5) were collected from the site and soil samples SS2, SS3, SS4 and SS5 were submitted for laboratory analysis. No assessment criteria exceedances occurred.

Based on the investigation results, JLG considers that no ASS Management Plan is required for the residential development proposed at the site.

1. Introduction

JL Geotechnical (JLG) was commissioned by Maureen Reid ('the client') to conduct an Acid Sulphate Soil (ASS) investigation for the land located at 12 Illawong Close Davistown NSW.

The objectives of the ASS investigation are to:

- ascertain the presence/absence of Acid Sulfate Soil (ASS) underneath the site
- assess the significance of potential ASS impacts for a proposed residential redevelopment
- make recommendations to inform management options (if necessary)
- satisfy Central Coast Council development application requirements

2. Site Identification

JLG accessed the NSW Government Planning Portal and NSW SixMaps on 5 December 2024 to obtain information about the site. Based on our review, it indicated that the site is rectangular and covers an area of 550m^2.

The site is legally identified as Lot 71 DP247248 and is located within the boundaries of the Central Coast Council (the council). The site is zoned as "R2-Low Density Residential" and development on the site is controlled by Gosford Development Control Plan 2013 (1 May 2020) and Wyong Development Control Plan 2013 (23 December 2020).

The site is bounded by low density residential properties to the north, south and west and Illawong Close to the east. The site location is presented on drawing 2425109.2/1.

3. Proposed Redevelopment and Land Use

JLG reviewed the proposed development plans, and it indicated that the site is being proposed for the construction of a standalone one-storey residence with a footprint of about 260m^2. The proposed site layout indicated that soft and hard landscape areas would occupy the remaining areas of the site. A copy of the "feasibility sketch plan" is presented Appendix A.

4. Environmental Setting

The site is located on the peninsula that separates Kincumber Broadwater and Cockle Channel within the south-eastern portion of the Central Coast region of NSW. Land across the locality is under low density residential, recreational and ecological conservation land uses.

4.1 Topography and Hydrology

Reference to the NSW Government planning portal indicated that elevations across the site and locality is below 10mAHD and generally falls slightly from the northwest towards the southeast.

No permanent water bodies were identified on the site. Stormwater from the site would most likely follow the site topography and runs over the ground surface towards Illawong Close and would eventually discharges into Kincumber Broadwater.

4.2 Geology and Hydrogeology

JLG accessed NSW Geoscience minview website to gather information about the surface geology of the site. Based on our review of the map of the locality, it indicated that the site is underlain by anthropogenic fill overlying quaternary channel sediments comprising sand and silty sands.

JLG carried out a search of NSW groundwater database on 5 December 2024 and it indicated that there are 4 registered boreholes within a radius of 500m of the site. The closest registered water bore, identified as GW202094, is located at about 200m southwest of the site. We noted the presence of water bores at various distances to the west, south and southeast of the site.

JLG review of the GW202094 drilling report indicated GW202094 was constructed in 2006 and was advanced to a depth of 4.5m below existing ground level. GW202094 intersects topsoil (0-0.5m), sandy clay (0.5-2.0m) and sand (2.0-4.5m). Groundwater was encountered at 2m below existing ground level.

JLG established a preliminary hydrogeological site model for this investigation based on information gathered from record reviews and this is summarised in Table 7.1 below.

Table 7.1 – Preliminary Hydrogeological Model

Aquifer Type and Lithology	Unconsolidated channel sediments
Perched Groundwater	Likely ephemeral within anthropogenic clay fill
Depth To Local Aquifer at Site	<2m bgl
Depth To Regional Aquifer at Site	More than 10m bgl
Local Groundwater Flow Direction	east/northeast towards Kincumber Broadwater
Regional Groundwater Flow Direction	east/southeast towards South Pacific Ocean
Receiving Environments	Cockle Channel, Kincumber Broadwater and South Pacific Ocean

4.3 Acid Sulfate Risk

Based on our review of the "Central Coast Development Plan 2022" (CCDP)section 7.1, the site is classified as Class 2 that indicates ASS soils are likely to be found below the natural ground surface. According to CCDP, works below the natural ground surface (e.g. footings/foundations) require an Acid Sulfate Soil Management Plan.

5. Site Features

JLG conducted a site walkover and an intrusive investigation at the site on 21 November 2024. Features JLG observed at the site included a a standalone two-storey residence, garage/carport and garden shed. The remaining area of the site was covered with lawn/garden and hardstand.

6. Previous Investigations

As of 6 December 2024, the information provided to JLG indicated that the site has not been the subject of any previous acid sulfate soil investigation.

7. Regulatory Framework and Guidance

The site walkover and intrusive site investigation activities that were carried out at the site were conducted in accordance with:

- Acid Sulphate Soil Manual, NSW Acid Sulfate Soil Management Advisory Committee, August (ASSMAC 1998)
- National Acid Sulfate Soil Guidance, Australia Government Department of Agriculture and Water Resources (DAWR), June 2018
- Waste Classification Guidelines Part 1. Classifying Waste. NSW EPA 2014 (EPA 2014a)
- Waste Classification Guidelines Part 4. Acid Sulfate Soils. NSW EPA 2014 (EPA 2014b)

7.1 Ground Conditions and Soil Sampling

Intrusive investigation at the site was carried out by way of two soil bores that were nominated as BH1 and BH2. These two soil bores were advanced using a Christie track-mounted rig and were located within the footprint of the proposed residence. The soil bore locations are presented on drawing 2425109.2/2.

BH1 and BH2 were advanced to a depth of about 4.5m bgl (target depth). The soil profiles encountered in BH1 and BH2 are summarised in Table 7.1 below.

Table 7.1 – Ground Condition

Depth Range (m)	Material Descriptions
0 – 0.2	Topsoil/Fill: clayey silt, black/dark brown with foot fibres and decomposed organic matter (dry)
0.2 – 1.0	Fill: silty clay yellow brown and grey mottled with minor gravel
1.0 – 4.5	Native: Silty sand, brown/grey/yellow brown, fine to medium grained

Groundwater table was encountered at about 1.0m bgl. Details of the soil profiles encountered in soil bores BH1 and BH2 are presented in logs presented in Appendix C.

Five representative soil SS1-SS5 were collected from the soil profiles encountered in BH1 and BH2. Each soil sample was collected using fresh new disposable nitrile gloves to prevent cross contamination. The soil samples were placed in glass jars provided by Australian Laboratory Services (ALS). The jars were filled to zero head space and then placed into an ice-filled chest before being transferred to ALS laboratories under a Chain of Custody (COC).

8. Assessment Criteria Selection Rationale

The assessment criteria for this investigation have been selected in accordance with ASSMAC 1998, Table 4.4. and were based on:

- net acidity of sulfidic soil materials
- soil textures observed in soil bores
- anticipated scale of ground disturbance within the footprint of the proposed development

No information is available about the proposed foundation/footings of the proposed residence. However, based on our experience, JLG is assumes that shallow foundation and/or screw piles would be adopted for the proposed development. In view of this, JLG considers that ground disturbance at the site during the construction phase of the proposed residential development would be limited to anthropogenic clayey fill encountered at the site. In view of this, JLG is assuming that ground disturbance at the site would likely generate less than 1000 tonnes of soil waste.

Based on the above rationale, JLG adopted net acidity of ≤ 0.1%S (sulfur units) and ≤ 62 mol H+/tonne (acidity units) as assessment criteria for this investigation.

9. Laboratory Testing

Quantitative laboratory analyses by the chromium suite were undertaken on SS2 (BH1, 0.5-0.6), SS3 (BH1, 1.0-1.1), SS4 (BH2, 0.5-0.6m) and SS5 (BH2, 1.0-1m). The details of the laboratory analyses are presented on the laboratory certificates presented in Appendix B.

10. Analytical Results and Interpretation

Actual Acidity:

Soil sample SS3 and SS5 returned pH_{KCL} results of 5.1 and 6.5 respectively.

Titratable Actual Acidity (acidity units) measured for SS3 as 12 mole H^+/t, whilst result for SS5 was below the laboratory level of reporting (LOR).

Sulfidic Titratable Actual Acidity (sTAA) measured for SS3 was 0.02. sTAA result for SS5 was below LOR.

Potential Acidity:

Soil sample SS3 and SS5 both returned Chromium Reducible Sulphur (CRS) result of 0.012 %S. SS2 and SS4 returned results of 0.022 %S and 0.016 %S respectively.

Acidity Chromium Reducible Sulphur result for both SS3 and SS5 were below LOR.

Acid Base Accounting:

SS3 returned Net Acid excluding Acid Neutralising Capacity (sulfur units) result of 0.03 %S. The result for SS5 was below LOR.

Net Acid excluding Acid Neutralising Capacity (acidity units) results for SS3 was 20 mole H^+/t. SS5 returned a result that was below LOR.

No criteria exceedances occurred.

Liming Rate:

Liming was recommended for SS3 only at a rate of 1Kg of $CaCO_3$/tonne of soil.

Based on the laboratory results, it indicated that the Net Acidity (sulfur units and acidity units) results did not exceed the assessment criteria adopted for the investigation. In view of this, JLG consider that no Acid Sulfate Soil management plan is required for the proposed residential development.

11. Conclusions

- The site covers 550m2 and is being proposed for the construction of a one-storey residence

- JLG visited the site on 21 November 2024 to conduct a site walkover and an intrusive investigation
- Two soil bores nominated as BH1 and BH2 were advanced at the site
- Soil profiles encountered underneath the site were consistent with NSW Geoscience geological mapping and comprised anthropogenic clayey fill overlying unconsolidated channel deposits
- Groundwater was encountered at 1.2 and 1m in BH1 and BH2 respectively
- Five soil samples nominated as SS1-SS5 were collected from soil profiles encountered at the site
- Quantitative laboratory analyses by the chromium suite were undertaken on SS2 (BH1, 0.5-0.6), SS3 (BH1, 1.0-1.1), SS4 (BH2, 0.5-0.6m) and SS5 (BH2, 1.0-1m)
- SS3 returned Net Acid excluding Acid Neutralising Capacity (sulfur units) result of 0.03 %S. The result for SS5 was below LOR
- Net Acid excluding Acid Neutralising Capacity (acidity units) results for SS3 was 20 mole H^+/t. SS5 returned a result that was below LOR
- No criteria exceedances occurred

Based on the results of this investigation, JLG considers that no ASS Management Plan is required for the proposed residential development provided the site is develop according to the proposed plan.

12. Limitations

JLG has conducted this investigation for this investigation in accordance with its current professional standard. It is based on generally accepted practices and standards at the time it was prepared. Laboratory testing was carried out by ALS Environmental laboratories based in Brisbane, a NATA-accredited for the analyses performed.

This report has been prepared in accordance with the scope of work and the objective outlined in Section 1 of this report. The methodology adopted and sources of information used by JLG are outlined in this report.

This report should be read in full and that no responsibility is accepted for use of any part of this report in any other context or for any other purposes. This report does not prompt to give legal advice.

This document and the information herein have been prepared solely for the use of Maureen Reid ('the client') for the purposes nominated in this report. No person or organisation other than Maureen Reid is entitled to rely on any part of the report without prior written consent of JLG. Any third party relying on this report shall have no legal recourse against JLG and shall indemnify and defend them from all and against all claims arising out of, or in conjunction with such use or reliance.

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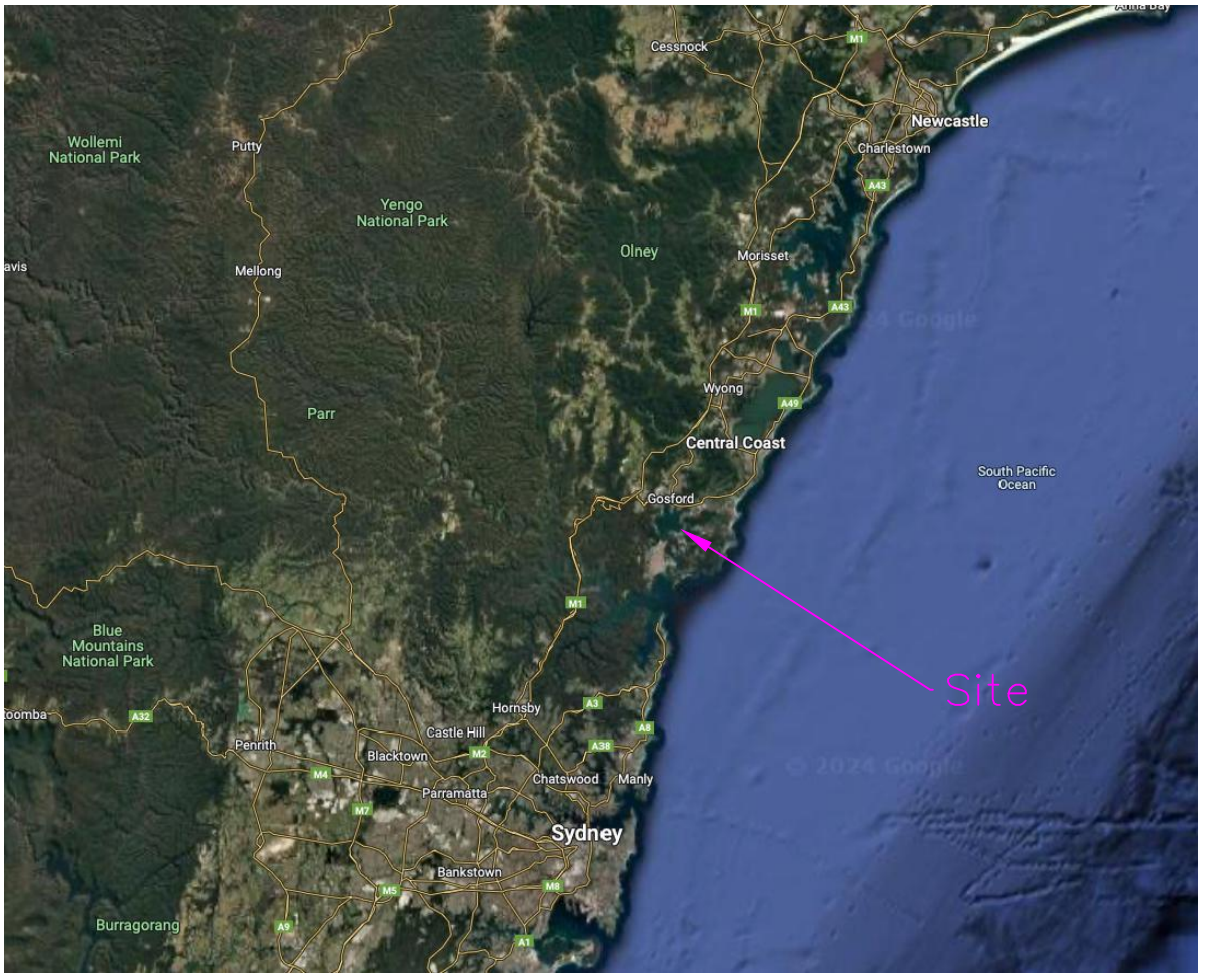
Figures

Acid Sulfate Site Investigation 12 Illawong Close Davistown NSW 2251

Site Location



Source: Google Maps

GENERAL NOTES :–
NOT TO SCALE

GENERAL NOTES :–

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DRAWN	JAP
DRAWING No.	2425109.2/1
DATE	6/12/2024

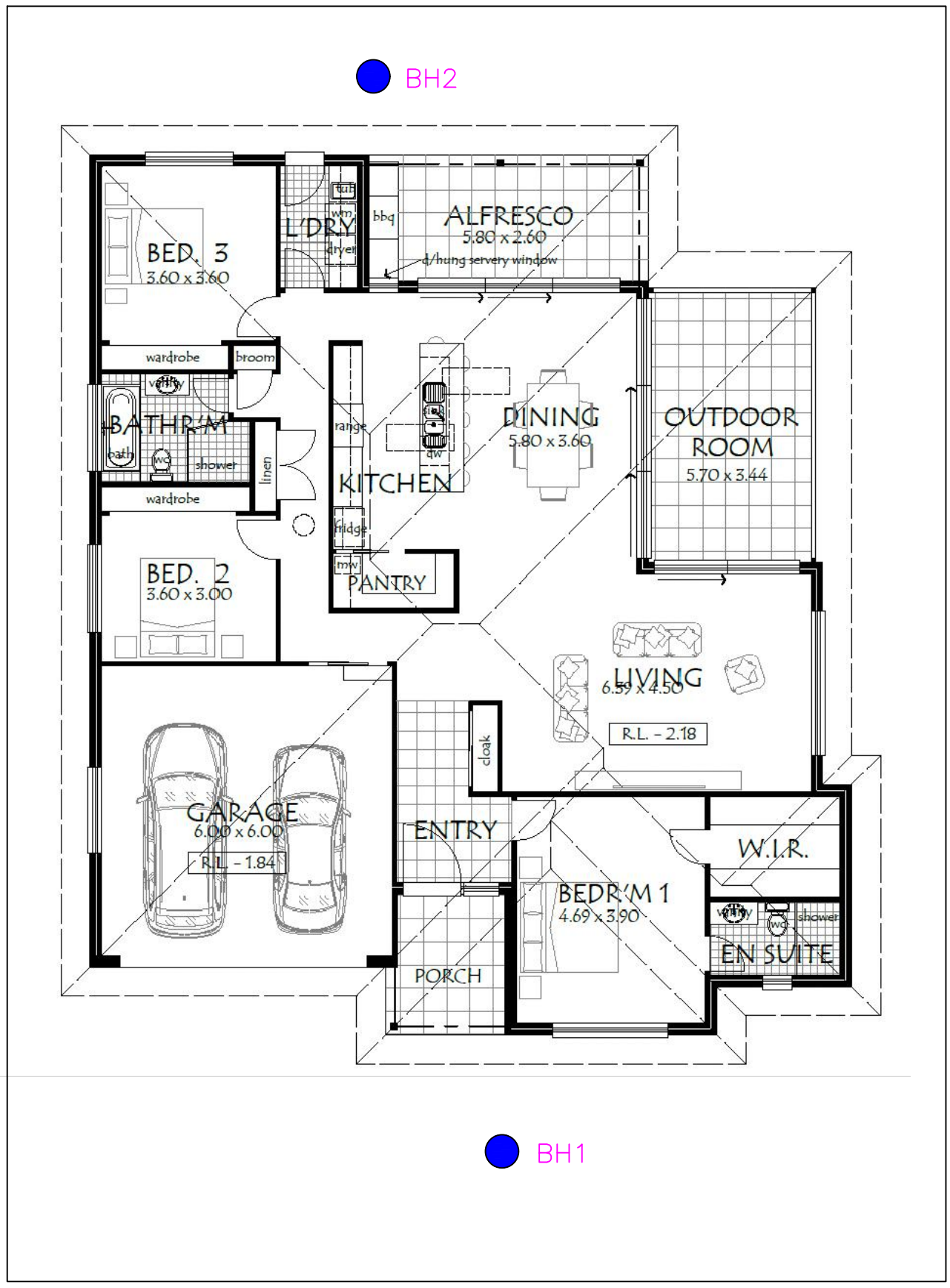
A4

Acid Sulfate Investigation 12 Illawing Close NSW 2251

Sampling Locations

13 DP14359

14 DP14359



70 DP247248

72 DP247248

Illawong Close

LEGEND

Site Boundary

BH1 Soil Bore Location and ID

GENERAL NOTES :–
DO NOT SCALE FROM THIS DRAWING

GENERAL NOTES :–

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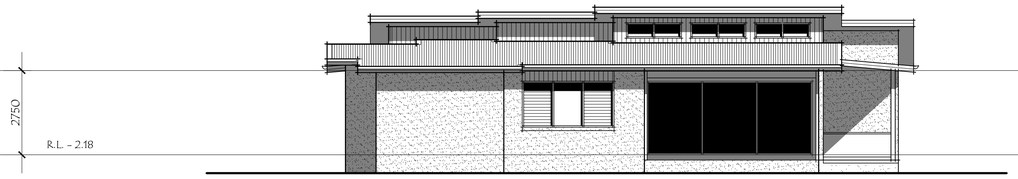
DRAWN	JAP
DRAWING No.	2425109.2/2
DATE	6/12/2024
	A4

Appendix A – Proposed Development Plan

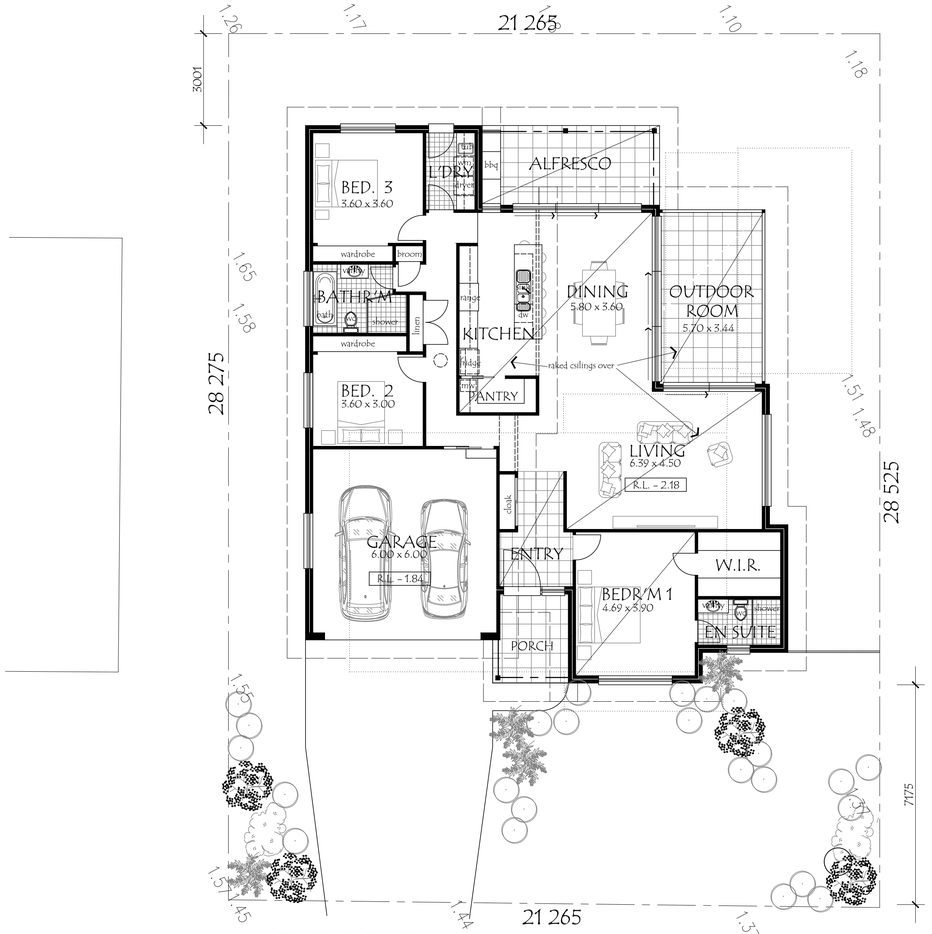


NORTH ELEVATION
SCALE 1:100

NORTH ELEVATION
SCALE 1:100

EAST ELEVATION
SCALE 1:100

EAST ELEVATION
SCALE 1:100



FLOOR PLAN. SKILLION ROOF / FINISHED BRICKWORK
SCALE 1:100 256.7m2 IN TOTAL (under roof)

SITE STATISTICS : COMPLYING DEVELOPMENT

NOTE:- calculations above as per cdc requirements

SITE AREA = 604 m² (calc.)

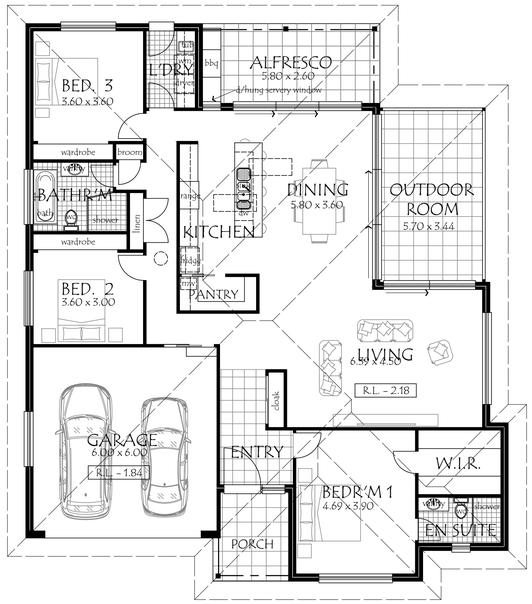
NEW RESIDENCE :-

FLOOR AREA	=	162.68 m²
GARAGE	=	56.0 m² - 18.0 m² (1 x carspace) = 13.75m²
TOTAL GROSS FLOOR AREA	=	198.68m² (max 335m²) *complies*
NEW ALFRESCO	=	15.0 m²
NEW FRONT PORCH	=	6.8 m²
OUTDOOR ROOM	=	19.6 m²
GROSS LANDSCAPE AREA	=	296.3 m² (min 188.04m² @ 30%) *complies*
BEHIND BUILDING LINE	=	186.4 m² (min 94.02m² @ 50%) *complies*
FORWARD BUILDING LINE	=	109.0 m² (min 47.01m² @ 25%) *complies*
ARTICULATION ZONE	=	5.16 m² (20.67m² X 25%) *complies*

CALCULATIONS FOR BUILDING COST PURPOSES

NOTE :- total of new residence including decks,void and garage measured from the outside walls

FLOOR AREA	=	179.25 m²
GARAGE	=	36.0 m²
OUTDOOR ROOM	=	19.6 m²
NEW ALFRESCO	=	15.0 m²
NEW FRONT PORCH	=	6.8 m²
TOTAL	=	256.65 m²



FLOOR PLAN. HIP ROOF / FACE BRICK
SCALE 1:100

FEASIBILITY SKETCH PLAN

PROPOSED NEW RESIDENCE.

AT:
LOT 71 & DP - 247548
12 ILLAWONG CLOSE, DAVISTOWN..

FOR:
REID.

DRAWN: M.J.V. DATE: JULY 2024
SCALE: 1:100 JOB N° 241008

ACCREDITED MEMBER OF BUILDING DESIGNERS ASSOCIATION OF NSW INC.
ACCREDITATION NO: 6141

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A1 ORIGINAL SIZE

Appendix B – Laboratory Certificates

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **ES2438946**	Page	: 1 of 5
Client	: **JL GEOTECHNICAL**	Laboratory	: Environmental Division Sydney
Contact	: JAP	Telephone	: +61-2-8784 8555
Project	: 2425109.1 ASS Investigation 12 Illawong Rd Davistown	Date Samples Received	: 28-Nov-2024
Site	: ----	Issue Date	: 10-Dec-2024
Sampler	: JL	No. of samples received	: 4
Order number	: ----	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, where applicable to the methodology, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
SS3, SS5	06-Dec-2024	27-Nov-2024	**9**	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
SS3, SS5	06-Dec-2024	27-Nov-2024	**9**	----	----	----
EA026 : Chromium Reducible Sulfur						
Soil Glass Jar - Unpreserved						
SS2, SS4	10-Dec-2024	21-Nov-2024	**19**	----	----	----
EA033-A: Actual Acidity						
Snap Lock Bag						
SS3, SS5	06-Dec-2024	21-Nov-2024	**15**	----	----	----
EA033-B: Potential Acidity						
Snap Lock Bag						
SS3, SS5	06-Dec-2024	21-Nov-2024	**15**	----	----	----
EA033-C: Acid Neutralising Capacity						
Snap Lock Bag						
SS3, SS5	06-Dec-2024	21-Nov-2024	**15**	----	----	----
EA033-D: Retained Acidity						
Snap Lock Bag						
SS3, SS5	06-Dec-2024	21-Nov-2024	**15**	----	----	----
EA033-E: Acid Base Accounting						
Snap Lock Bag						
SS3, SS5	06-Dec-2024	21-Nov-2024	**15**	----	----	----

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
Major Anions - Soluble	ED040S	0	2	0.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	27-Nov-2024	×	**06-Dec-2024**	06-Dec-2024	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	27-Nov-2024	×	**06-Dec-2024**	03-Jan-2025	✓
EA026 : Chromium Reducible Sulfur							
Soil Glass Jar - Unpreserved (EA026)							
SS2, SS4	**20-Nov-2024**	**10-Dec-2024**	21-Nov-2024	×	**10-Dec-2024**	10-Mar-2025	✓
EA033-A: Actual Acidity							
Snap Lock Bag (EA033)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	21-Nov-2024	×	**09-Dec-2024**	06-Mar-2025	✓
EA033-B: Potential Acidity							
Snap Lock Bag (EA033)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	21-Nov-2024	×	**09-Dec-2024**	06-Mar-2025	✓
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag (EA033)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	21-Nov-2024	×	**09-Dec-2024**	06-Mar-2025	✓
EA033-D: Retained Acidity							
Snap Lock Bag (EA033)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	21-Nov-2024	×	**09-Dec-2024**	06-Mar-2025	✓
EA033-E: Acid Base Accounting							
Snap Lock Bag (EA033)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	21-Nov-2024	×	**09-Dec-2024**	06-Mar-2025	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
SS3, SS5	**20-Nov-2024**	**----**	----	**----**	**29-Nov-2024**	04-Dec-2024	✓
ED040S: Soluble Major Anions							
Soil Glass Jar - Unpreserved (ED040S)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	18-Dec-2024	✓	**06-Dec-2024**	03-Jan-2025	✓
ED045G: Chloride by Discrete Analyser							
Soil Glass Jar - Unpreserved (ED045G)							
SS3, SS5	**20-Nov-2024**	**06-Dec-2024**	18-Dec-2024	✓	**06-Dec-2024**	03-Jan-2025	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chloride Soluble By Discrete Analyser	ED045G	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Reducible Sulphur	EA026	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	3	21	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	0	2	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	2	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chloride Soluble By Discrete Analyser	ED045G	2	2	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Reducible Sulphur	EA026	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	2	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chloride Soluble By Discrete Analyser	ED045G	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Reducible Sulphur	EA026	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chromium Suite for Acid Sulphate Soils	EA033	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Soluble	ED040S	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride Soluble By Discrete Analyser	ED045G	1	2	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Chromium Reducible Sulphur	EA026	SOIL	In house: Referenced to Sullivan et al (1998) The CRS method converts reduced inorganic sulfur to H2S by CrCl2 solution ; the evolved H2S is trapped in a zinc acetate solution as ZnS which is quantified by iodometric titration.
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Resistivity (1:5)	EA080	SOIL	In house: Calculated from Electrical Conductivity
Corrosion Classification for Steel and Concrete Piles	* EA167	SOIL	In house: Exposure classification is determined according to Australian Standard AS2159-2009.
Major Anions - Soluble	ED040S	SOIL	In house: Soluble Anions are determined off a 1:5 soil / water extract by ICPAES.
Chloride Soluble By Discrete Analyser	ED045G	SOIL	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm. Analysis is performed on a 1:5 soil / water leachate.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.

CERTIFICATE OF ANALYSIS

Work Order	: **ES2438946**	Page	: 1 of 4
Client	: **JL GEOTECHNICAL**	Laboratory	: Environmental Division Sydney
Contact	: JAP	Contact	: Customer Services ES
Address	: Minto	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 2425109.1 ASS Investigation 12 Illawong Rd Davistown	Date Samples Received	: 28-Nov-2024 14:40
Order number	: ----	Date Analysis Commenced	: 29-Nov-2024
C-O-C number	: ----	Issue Date	: 10-Dec-2024 13:19
Sampler	: JL		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Corrosion assessment for Concrete and Steel piles in soil per Australian Standard AS2159-2009 uses a combination of soil and groundwater data (Tables 6.4.2 C & 6.5.2 C). In the absence of groundwater data, assessment has been made against soil criteria only. Refer to AS2159-2009 section 6.4 for further interpretation of corrosion assessment. ALS is not NATA accredited for Corrosion Assessment comments
- EA167: Soil Condition A – High permeability soils (e.g. sands and gravels) which are in groundwater
- EA167: Soil Condition B – Low permeability soils (e.g. silts and clays) or all soils above groundwater
- ASS: EA033 (CRS Suite): Analysis is performed as per the Acid Sulfate Soils Laboratory Methods Guidelines (2004) and the updated National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT (2018)
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SS2	SS3	SS4	SS5	----
			Sampling date / time	20-Nov-2024 00:00	20-Nov-2024 00:00	20-Nov-2024 00:00	20-Nov-2024 00:00	----
Compound	CAS Number	LOR	Unit	ES2438946-001	ES2438946-002	ES2438946-003	ES2438946-004	--------
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	----	4.9	----	7.6	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	68	----	21	----
EA026 : Chromium Reducible Sulfur								
Chromium Reducible Sulphur	----	0.005	%	0.022	----	0.016	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	----	5.1	----	6.5	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	12	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	0.02	----	<0.02	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	----	0.012	----	0.012	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	----	<10	----	<10	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	0.09	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	18	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	0.03	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	----	1.5	----	1.5	----
Net Acidity (sulfur units)	----	0.02	% S	----	0.03	----	<0.02	----
Net Acidity (acidity units)	----	10	mole H+ / t	----	20	----	<10	----
Liming Rate	----	1	kg CaCO3/t	----	1	----	<1	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	----	0.03	----	<0.02	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	----	20	----	<10	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	----	1	----	<1	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	9.6	----	13.4	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SS2	SS3	SS4	SS5	----
			Sampling date / time	20-Nov-2024 00:00	20-Nov-2024 00:00	20-Nov-2024 00:00	20-Nov-2024 00:00	----
Compound	CAS Number	LOR	Unit	ES2438946-001	ES2438946-002	ES2438946-003	ES2438946-004	--------
				Result	Result	Result	Result	----
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**----**	**14700**	**----**	**47600**	**----**
EA167: Corrosion Classification (per AS2159-2009)								
ø Exposure Classification - Concrete Piles Soil Condition A	----	-	-	**----**	**Moderate**	**----**	**Mild**	**----**
ø Exposure Classification - Concrete Piles Soil Condition B	----	-	-	**----**	**Mild**	**----**	**Non Aggressive**	**----**
ø Exposure Classification - Steel Piles Soil Condition A	----	-	-	**----**	**Mild**	**----**	**Non Aggressive**	**----**
ø Exposure Classification - Steel Piles Soil Condition B	----	-	-	**----**	**Non Aggressive**	**----**	**Non Aggressive**	**----**
ED040S: Soluble Major Anions								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	**----**	**80**	**----**	<10	**----**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**----**	**20**	**----**	<10	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry / Biology).

(SOIL) EA026 : Chromium Reducible Sulfur

(SOIL) EA033-B: Potential Acidity

(SOIL) EA033-C: Acid Neutralising Capacity

(SOIL) EA033-D: Retained Acidity

(SOIL) EA033-A: Actual Acidity

(SOIL) EA033-E: Acid Base Accounting

QUALITY CONTROL REPORT

Work Order	: **ES2438946**	Page	: 1 of 5
Client	: **JL GEOTECHNICAL**	Laboratory	: Environmental Division Sydney
Contact	: JAP	Contact	: Customer Services ES
Address	: Minto	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: 2425109.1 ASS Investigation 12 Illawong Rd Davistown	Date Samples Received	: 28-Nov-2024
Order number	: ----	Date Analysis Commenced	: 29-Nov-2024
C-O-C number	: ----	Issue Date	: 10-Dec-2024
Sampler	: JL		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 4		
No. of samples analysed	: 4		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

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Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 6224147)									
ES2438946-002	SS3	EA002: pH Value	----	0.1	pH Unit	4.9	5.2	4.9	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 6224148)									
ES2438946-002	SS3	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	68	66	3.6	0% - 20%
EA026 : Chromium Reducible Sulfur (QC Lot: 6244758)									
ES2438946-001	SS2	EA026: Chromium Reducible Sulphur	----	0.005	%	0.022	0.021	4.7	No Limit
EA033-A: Actual Acidity (QC Lot: 6239767)									
EB2441730-004	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.4	6.4	0.0	0% - 20%
EB2441920-004	Anonymous	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	8.4	8.5	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 6239768)									
ES2438946-004	SS5	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.5	6.6	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 6239767)									
EB2441730-004	Anonymous	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.011	0.013	19.5	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB2441920-004	Anonymous	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.409	0.409	0.0	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA033-B: Potential Acidity (QC Lot: 6239767) - continued									
EB2441920-004	Anonymous	EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	255	255	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 6239768)									
ES2438946-004	SS5	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	0.012	0.015	16.6	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA033-C: Acid Neutralising Capacity (QC Lot: 6239767)									
EB2441920-004	Anonymous	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	15.0	15.2	1.6	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	4.80	4.88	1.6	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	2990	3040	1.6	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 6239768)									
ES2438946-004	SS5	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.09	0.01	146	No Limit
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.03	<0.01	95.3	No Limit
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	18	<10	55.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 6224149)									
ES2438946-002	SS3	EA055: Moisture Content	----	0.1	%	9.6	10.5	8.7	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 6224146)									
ES2438946-002	SS3	ED045G: Chloride	16887-00-6	10	mg/kg	20	20	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 6224147)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.8	101
				----	7 pH Unit	100	98.8	101
EA010: Conductivity (1:5) (QCLot: 6224148)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	98.0	92.0	108
EA026 : Chromium Reducible Sulfur (QCLot: 6244758)								
EA026: Chromium Reducible Sulphur	----	0.005	%	<0.005	0.283 %	99.3	78.7	111
EA033-A: Actual Acidity (QCLot: 6239767)								
EA033: pH KCl (23A)	----	----	pH Unit	----	4.7 pH Unit	98.9	80.0	120
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	23.5 mole H+ / t	104	80.0	120
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 6239768)								
EA033: pH KCl (23A)	----	----	pH Unit	----	4.7 pH Unit	98.8	80.0	120
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	23.5 mole H+ / t	110	80.0	120
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 6239767)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.283 % S	98.6	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 6239768)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.283 % S	99.3	77.0	121
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 6239767)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	10 % CaCO3	98.0	91.0	112
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 6239768)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	10 % CaCO3	98.0	91.0	112
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----
ED040S: Soluble Major Anions (QCLot: 6224145)								
ED040S: Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	750 mg/kg	103	80.0	120

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 6224146)								
ED045G: Chloride	16887-00-6	10	mg/kg	<10	250 mg/kg	106	75.0	125
				<10	5000 mg/kg	103	79.0	117

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 6224146)							
ES2438946-002	SS3	ED045G: Chloride	16887-00-6	1250 mg/kg	117	70.0	130

CHAIN OF CUSTODY

ALS Laboratory: please tick →

CLIENT: JL Geotechnical Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE:			Custody Seal Intact? Yes No N/A
PROJECT: 2425109.1 ASS Investigation 12 Illawong Rd Davistown	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:		COC: 1	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: JAP CONTACT PH: 0421814766		OF: 1	

SAMPLER: JL SAMPLER MOBILE: 0416820362	RELINQUISHED BY:	RECEIVED BY: [signature]	RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO) EDD FORMAT (or default):				
Email Reports to: alex.pierre@jlgeotechnical.com.au	DATE/TIME:	DATE/TIME: 28/11/24 1440	DATE/TIME:	DATE/TIME:
Email Invoice to: accounts@jlgeotechnical.com.au				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).			Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	EA033	Corro. Schedule 1	EA026	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	SS1	20/11/2024	Soil	Nil	1	x	x		
1	SS2	20/11/2024	Soil	Nil	1			x	
2	SS3	20/11/2024	Soil	Nil	1	x	x		
3	SS4	20/11/2024	Soil	Nil	1			x	
4	SS5	20/11/2024	Soil	Nil	1	x	x		
	TOTAL				5	3	3	2	

Subcon / Forward Lab / Split WO: Brisbane
Lab / Analysis: CRS + Chromium Suite
Organised By / Date:
Relinquished By / Date:
Connote / Courier:
WO No: ES2438946
Attached By PO / Internal Sheet:

Environmental Division
Sydney
Work Order Reference
ES2438946

Telephone : + 61-2-8784 8555

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Appendix C – Borehole Log

Borehole No.

BH1

Page 1 of 1

Log - Borehole

Project No.: 2425109

Client:	Maureen Reid	Commenced:	21/11/2024
Project Name:	Acid Sulfate Investigation	Completed:	21/11/2024
Hole Location:	12 Illawong Close Davistown 2251	Logged By:	JL
Hole Position:		Checked By:	JL
		RL Surface:	No survey
		Datum:	AHD Operator:

Drilling Information					Soil Description			Observations
Method	Depth (m)	Water Level	PID	Samples Tests Remarks	Graphic Log	Group Symbol	Material Description	Structure and Additional Observations
	0			SS1 0.1-0.8m		ML	Clayey SITL, Black to dark brown, Mixed with Clay, Red Brown, with organics, roots (Fill)	
				SS2 0.50-0.60 m		CI	CLAY, Yellow-Brown, Low to Mediul Plastic, with traces of Gravel (Fill)	
	1	▽		SS3 1.00-1.10 m		SM	Silty SAND, Brow-Grey becoming Yellow-Grey, Well Graded becoming poorer with depth, Fine to medium grained (Alluvial)	Water Table?
	2							
	3							
	4							
							Hole Terminated at 4.50 m Refusal	
	5							

Method

AS - Auger Screwing
RR - Rock Roller
WB- Washbore
HQ3 HQ3 Core Barrel
NQ3 NQ3 Core Barrel

Water

Level (Date)
Inflow

Samples and Tests

U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
CBR- CBR Mould Sample

Support

T - Timbering

Classification Symbols and Soil Descriptions

Based on Unified Soil Classification System

Borehole No.

BH2

Page 1 of 1

Log - Borehole

Project No.: 2425109

Client:	Maureen Reid	Commenced:	21/11/2024
Project Name:	Acid Sulfate Investigation	Completed:	21/11/2024
Hole Location:	12 Illawong Close Davistown 2251	Logged By:	JL
Hole Position:		Checked By:	JL
		RL Surface:	No survey
		Datum:	AHD Operator:

Drilling Information					Soil Description			Observations
Method	Depth (m)	Water Level	PID	Samples Tests Remarks	Graphic Log	Group Symbol	Material Description	Structure and Additional Observations
	0			SS4 0.50-0.60 m		ML	Clayey SITL, Black to dark brown, Mixed with Clay, Red Brown, with organics, roots (Fill)	
						CI	CLAY, Yellow-Brown, Low to Mediul Plastic, with traces of Gravel (Fill)	
	1	▽		SS5 1.00-1.10 m		SM	Silty SAND, Brow-Grey becoming Yellow-Grey, Well Graded becoming poorer with depth, Fine to medium grained (Alluvial)	Water Table?
	2							
	3							
	4							
							Hole Terminated at 4.50 m Refusal	
	5							

Method

AS - Auger Screwing
RR - Rock Roller
WB- Washbore
HQ3 HQ3 Core Barrel
NQ3 NQ3 Core Barrel

Water

Level (Date)
Inflow

Samples and Tests

U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
CBR- CBR Mould Sample

Support

T - Timbering

Classification Symbols and Soil Descriptions

Based on Unified Soil Classification System

Appendix D – Site Photographs

Plate A: Front yard on eastern portion of site, on BH1 looking east

Plate E: Channel sediments (silty sand) in BH1

Plate D: Top of Saturated sediments in BH1

Plate C: Anthropogenic fill (silty clay with minor gravel) in BH1

Plate B: Top layer of unconsolidated sediments in BH1

End of Document